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Reconstruction of the sedimentological bodies and depositional history of the Ece and Faber travertines, Ballık area, Denizli, SW Turkey.

Claes, H.[1], Soete, J.[1], Claes, S.[1], Foubert, A.[2], Özkul, M.[3], Swennen, R.[1]
[1]*Geology, Earth and Environmental Sciences, KU Leuven, Celestijnenlaan 200E, 3001 Heverlee, Belgium (hannes.claes@ees.kuleuven.be).*
[2]*Geosciences, Earth Sciences, Chemin du Musée 6, 1700 Fribourg, Switzerland.*
[3]*Geological Engineering, Pamukkale University,* Kınıklı Campus 20070, *Denizli, Turkey.*

In 2006 the Tupi oil field (now Lula oil field) was discovered, with microbial carbonates acting as reservoir rocks. Similar reservoir discoveries, in front of the east coast of South America as well as west of Africa, resulted in an increased interest in these microbial carbonates. From an exploration point of view the distribution and extension of the different geobodies and their petrophysical properties need to be delineated. Local sedimentological observations are limited to core scale and should be extrapolated to a larger context. Hence the necessity for analogue studies worldwide. Several of the observed core fabrics are widely recognized in travertine and tufa settings. This study focuses on two travertine quarries (of ~250m by ~400m) in the Ballık area, in the Denizli extensional basin (SW Turkey).

Based on extensive fieldmapping, including four ~70 meter long litholog sections and detailed linedrawings, the facies were delineated over the quarry walls. 5 major facies were recognized forming a domal structure. The lowermost "Sub-horizontal Travertine" facies is characterized by sub-horizontal (inclinations not exceeding 5°) laminations, apparent due to the millimetre to centimetre-scale alternation of white, white to beige and brownish layers of mainly peloidal micritic travertine and is accentuated by layer parallel porosity. It is intercalated by several "Marl-conglomerate" facies units, with varying amounts of rounded quartz pebbles inside a browner marly matrix. The first two facies are covered by the "Cascade" facies that evolves from smooth sloping (>10°) crenulating, to steeper constant sloping (<60°), centimetre to 5 centimetre isopachous alternations of micritic, plant mould rich, and dense crust units. The "Cascade" facies can evolve into the "Waterfall" facies, characterized by steep sloping (45-90°) anisopachous and even discontinuous layers, associated with centimetre to metre scaled caves, resulting in high porosities (>15%). The sloping facies are covered by the "Reed" facies, typified by a relatively high occurrence of plant moulds. While on metre scale lamination often can be considered as sub-horizontal, on smaller scale the layers crenulate around the reed moulds. Several smaller reed bodies are observed forming bioherm-like structures intercalating the other facies. Each facies is typical for a depositional environment and can be recognized based on the occurrence of typical lithotype assemblages.

The 3D geobody architecture was obtained by extrapolating the 2D mapped facies cross-sections of the quarry walls, inside and between the quarries. The inferred 3D architecture combined with the environmental interpretation of the facies allowed reconstructing the depositional history.
Currently the petrophysical properties of the different facies are being characterized. Together with the 3D model, they provide the base for a ~25.10^6 m^3 reservoir rock property simulation.